

Low-Temperature Joining of SiC-Matrix Composites, Phase I

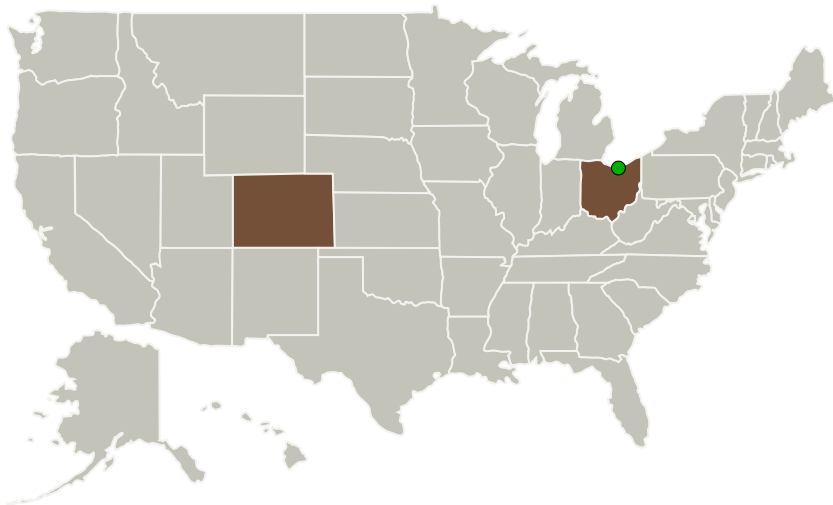
Completed Technology Project (2011 - 2011)



Project Introduction

The outstanding properties of silicon carbide (SiC) include excellent specific strength, extreme chemical resistance, tremendous hardness, and retention of its high strength at very high temperatures. The brittleness typically associated with a ceramic can be mitigated by forming composites with either carbon or SiC fibers. However, the processes for forming SiC matrix composites limit the size and complexity of the resulting shapes. It is therefore necessary to develop techniques for efficiently joining SiC matrix composite parts. Many such methods have been proposed over the past 25 years, but none is satisfactory, and it remains an active area of research. The joints formed so far either require extremely high temperatures to manufacture or result in unsatisfactory mechanical properties. TDA is herein proposing a route that will result in a pure SiC bond, and will achieve it without requiring any external heat source. As such the joint will be robust, and have the same temperature capabilities and mechanical properties as the matrix. The technology will have met the criteria for exiting technical readiness level (TRL) 3, and some of the criteria for TRL 4, by the end of the Phase I period.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
TDA Research, Inc.	Lead Organization	Industry	Wheat Ridge, Colorado
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Colorado	Ohio

Project Transitions

▶ **February 2011:** Project Start

✓ **September 2011:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138280>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

TDA Research, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Michael Diener

Co-Investigator:

Michael Diener

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Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.4 Manufacturing
 - └ TX12.4.1 Manufacturing Processes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System